WHEN IS A "WATERPROOFING MEMBRANE" NOT A WATERPROOFING MEMBRANE?

BY JUSTIN HENSHELL, FAIA, FASTM

Waterproofing is a term that membrane manufacturers use loosely to describe any product that can retard the passage of water. The membranes may be in sheet form or liquid-applied. They are used above ground on spandrels and façades; on water-containment structures, including planters; under mechanical-room and shower-room floors; in cavity walls; under green vegetative roofs; and on plazas over occupied spaces. Below ground, they are used over earth-covered suspended slabs, on foundations, and under pressure slabs on grade.

The ASTM standard definition for waterproofing (ASTM D1079) defines it as "treatment of a surface to prevent the passage of water *under hydrostatic pressure*" (emphasis added).

None of the membranes on the above-ground components previously listed (with the exception of water-containment structures such as swimming and reflecting pools, cisterns, sump pits, and the like) are required to resist hydrostatic pressure. Either they are oriented vertically or sloped and not subject to gravity-induced water pressure; or, when in a horizontal position,

Waterproofing Redefined

The term "waterproofing" is all-encompassing. To be useful, a definition should be more specific as to location and function. When used in reference to the various materials applied to suspended slabs and below-grade building enclosures, I suggest modifying the term to "building waterproofing" to differentiate it from membranes under interior wet locations, water containment structures, and vertical, above-grade components of the building envelope.

Definition

I suggest that the term "building waterproofing" should be defined as a membrane, coating, or material that prevents the passage of water on the positive (wet) or negative (dry) side (interior side) of the building envelope that is not exposed to the elements.

Rationale

In waterproofing, hydrostatic pressure provides the force to move water through the building envelope, but need not be a factor in its definition. Lateral hydrostatic pressure is exerted on below-grade foundations and slabs on grade by an elevated water table. Vertical hydrostatic pressure is exerted on suspended slabs by gravity.

The force of gravity will exert hydrostatic pressure on a suspended slab from even a monomolecular film of water. Therefore, tests to quantify resistance to the passage of water should be specific as to the maximum pressure the membrane, coating, or material must be capable of withstanding, and leave it to the judgment of the designer to select the one most appropriate for the project conditions.

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cannot accumulate a significant head of water. For example, plazas are unlikely to experience accumulations of water in excess of 3 inches, even when drains are clogged. Green, vegetative roofs are designed to drain and discharge water, albeit slowly, to internal drainage systems.

ASTM D5957, which is a guide for flood-testing membranes, requires the membrane to be flooded with a minimum of 1 inch and a maximum of 4 inches of water. This translates to a maximum pressure of about 20 psf, which is the minimum live load on roofs and which is transient. Hydrostatic pressure is required to overcome the surface tension of water over cracks and membrane discontinuities and to permit water infiltration. However, to penetrate a membrane, heads in excess of 3 inches are required.

Intermittent hydrostatic pressure on foundations produced by rainfall on residential and shallow basements is rarely a concern. Most dampproofing coatings are capable of preventing significant leaking, except when flooding occurs or where basements are built into the hillside. Therefore, in areas where flooding is common, as well as where basements are more than 20 ft below grade, waterproofing systems discussed below should be strongly considered.

Significantly, ASTM C836, the standard for cold, liquid-applied waterproofing, does not list resistance to hydrostatic pressure as a required physical property. Consequently, with few exceptions, manufacturers of hot and cold liquid-applied membranes for plazas and below grade do not publish test results for resistance to hydrostatic pressure either.

On the other hand, virtually all sheet-membrane manufacturers routinely include resistance to hydrostatic pressure in their tables of physical properties. Except for PVC and butyl, most sheet systems are based on the test protocol set forth in ASTM D5385, Test Method for Hydrostatic Pressure Resistance of Waterproofing Membranes. PVC uses D751 for coated fabrics. With few exceptions, sheet membranes can pass a test for resisting a pressure of over 200 ft of water. So can encapsulated and laminated (but not cardboard-faced) bentonite clay products.

Most manufacturers of negative-side waterproofing such as crystalline, metal oxide, and polymer-modified cement, conform to the Corps of Engineers' CRD-C48-73, which requires resistance to hydrostatic pressure at a depth of 405 feet. However, the watertight integrity of concrete slabs and foundations that are waterproofed with these materials depends more on the efficacy of waterstops in cold joints than on the water-resistant properties of the coating.

When below-grade structures that enclose habitable spaces or enclosed horizontal surfaces experience significant hydrostatic pressure, whether continuous or intermittent, the prudent designer should specify sheet membranes with published test results verifying that they can resist at least 125% of the anticipated pressure. If the designer elects to specify hot or cold liquid-applied membranes, he or she should ensure that the manufacturers have published test reports, based on accepted standards, certifying the membranes' capacity to resist 125% of the maximum anticipated pressure.

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